

AMENDMENT AND RESPONSE UNDER 37 CFR § 1.111
Serial Number: 10/815,241
Filing Date: March 30, 2004
Title: A SEGMENTED BRANCH PREDICTOR

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REMARKS

Applicant respectfully requests reconsideration of this application in view of the following remarks and the above amendments. This response is believed to fully address all issues raised in the Office Action mailed December 18, 2006. Furthermore, no new matter is believed to have been introduced hereby.

Claims 7, 18, and 20 have been amended as detailed above. Accordingly, claims 1-21 remain pending in the present application.

Claim Objection

Objection to claim 7 is believed to have been overcome via the amendment detailed above.

Specification Objection

Objection to paragraph [0018] of the specification is believed to have been overcome via the amendments detailed above.

35 USC § 101 Rejection of the Claims

Claims 18-21 stand rejected under 35 USC § 101. These claims have been amended as detailed above. Accordingly, it is respectfully submitted that these claims are in condition for allowance.

35 USC § 112 Rejection of the Claims

Claims 7-11 stand rejected under 35 USC § 112, second paragraph. It is respectfully submitted that these claims are in condition for allowance at least based on the amendments detailed above.

35 USC § 102 Rejection of the Claims

Claims 1-21 were rejected under 35 USC § 102(b) as being anticipated by Baweja et al. (U.S. Patent No. 6,332,189).

These rejections are respectfully traversed.

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Additionally, the undersigned cannot understand some of the reasoning provided in rejecting the claims. Starting with rejection of claim 1, for example, the office states that:

As per claim 1, Baweja teaches an apparatus comprising:

storage means for storing a first type of branch history information (see e.g. Fig.

1b-1c, wherein element 122 (Fig. 1b) and element 132 (Fig. 1c) are the storage means.

Also, see e.g. Fig. 2, wherein element 220 is (Fig. 1b) and element 230 (Fig. 1c), see col. 4, lines 51-67 to col. 5, lines 1-51);

Specifically, the undersigned is unable to find element 220 in Fig. 1b or element 230 in Fig. 1c of Baweja. Even if these elements (220 and 230) were relied on to reject the claimed element of "storage means" the undersigned is at a loss. Elements 220 and 230 appear to be predictors shown in Fig. 2 and appear to have nothing to do with the claimed "storage means."

If a subsequent Office Action is to be mailed in the present application, applicant hereby respectfully requests a more clear rejection of claims pursuant to MPEP §706.

35 USC §102 Rejection Requirements

Additionally, the Office is respectfully reminded of the requirements of MPEP §2131 that states a "claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference" (citing *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)).

Pursuant to MPEP §2112, it is respectfully submitted that the record fails to provide any factual support for a finding of teaching by inherency. In particular, MPEP §2112 in part states that:

The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. In re Rijckaert, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993) (reversed rejection because inherency was based on what would result due to optimization of conditions, not what was necessarily present in the prior art); In re Oelrich, 666 F.2d 578, 581-82, 212 USPQ 323, 326 (CCPA 1981). "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so

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recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities.

In particular, the Office fails to establish at least the highlighted elements of claim 12 are taught by Baweja (reproduced below for the ease of Office):

12. A processor comprising:
a storage unit for storing a first type of branch history information;
a plurality of intermediate prediction units to generate a plurality of intermediate branch prediction results based off of a plurality of portions of the store branch history information, wherein each intermediate prediction unit uses a portion of the branch history information that is smaller than all of the branch history information stored within the storage unit in order to generate the plurality of intermediate branch prediction results.

For example, the Office fails to establish that Baweja teaches that a plurality of portions of the stored branch history information are used to generate the intermediate branch predications. Specifically, in rejecting claim 12, the office states that:

Claims 12-17 are rejected on grounds corresponding to the reasons given above for claims 1-6.

In rejecting the relevant portion of claim 1, the Office states:

See e.g. col. 4, lines 12-18 and col. 5, lines 1-51), wherein the intermediate prediction means uses a portion of the branch history information that is smaller than all of the branch history information stored within the storage means in order to generate the plurality of intermediate branch prediction results (see e.g. Fig. 2, wherein as long as all the branch history information are not been used for the final result, then it's smaller all of the branch history information stored within the storage means; see also, col. 4, lines 51-67 to col. 5, lines 1-51);

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Fig. 2 of Baweja fails to teach the highlighted portion of claim 12 above. Also, column 4, lines 51-67 to column 5, lines 1-51, fail to cure this shortcoming. In fact, Fig. 2 fails to show any history information. The cited text of Baweja is reproduced below for the Office's ease of reference:

FIG. 1g illustrates a branch predictor 170, sometimes called a serial-BLG predictor, having a series combination of a bimodal predictor 172, a local predictor 174, and a global predictor 176. In the serial-BLG predictor embodiment illustrated, the fast adaptability of the first stage, the bimodal predictor stage 172, allows the serial-BLG predictor 170 to adapt quickly. The first stage covers the most common cases in a small physical size, allowing the second and third stages, 174 and 176, to be designed to handle only those cases where the first stage prediction is wrong.

Referring now to FIG. 2, illustrated is our series-parallel branch predictor 200, described and claimed in our above-referenced patent application. The branch predictor includes a bimodal predictor 210 in series with a local predictor 220. This series combination forms a first portion of the branch predictor 200, and has a first output, described more fully below. The bimodal predictor 210 may be similar to the

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bimodal predictor illustrated in FIG. 1a, but need not be; it need simply perform a bimodal prediction. Similarly, the local predictor 220 may be similar to that illustrated in FIG. 1b, but need not be; it need simply perform a local prediction.

With continued reference to FIG. 2, a global predictor 230 forms a second portion of our series-parallel branch predictor 200, and has a second output. The global predictor 230 may be similar to the global predictor illustrated in any of FIGS. 1c-1e, but need not be; it need simply perform a global prediction.

The embodiment of the series-parallel branch predictor illustrated in FIG. 2, further includes a portion 240 having an array of 2-bit counters 242. The portion 240 receives certain data regarding a branch instruction address. The data include a branch instruction address. It also includes information regarding which has been the better prediction in the past, that is, whether the second output of the global predictor 230, or the first output of the series combination of the bimodal predictor 210 and the local predictor 220 has, in the past, been the better prediction.

With continued reference to FIG. 2, included also is a multiplexor 250. The multiplexor 250 receives both the first and second outputs, and also a third output from the portion 240. With these outputs, the multiplexor 250 outputs a prediction of what the taken branch should be. This prediction is made by selecting either the first output or the second output, based upon the third output.

In the embodiment illustrated in FIG. 2, the first output is either the bimodal prediction of the bimodal predictor 210 or the local prediction of the local predictor 220. The local prediction is used when there is a "hit" in the local history table, and the bimodal prediction is used when there is not, as described more fully in our above-referenced related patent application. The second output is the global prediction of the global 230. The third output includes information regarding whether the first output or the second output has, in the past, been the better predictor. Using these inputs, the multiplexor 250 selects either the first output (which is either the local prediction or the bimodal prediction) or the second output (which is the global prediction) as the prediction of the taken branch.

As will be apparent to those skilled in the art having benefit of the present teachings and those contained in the above-referenced related patent application, any desired bimodal predictor structure may be used for the bimodal predictor 210, any desired local predictor structure may be used for the local predictor 220, and any desired global predictor structure may be used for the global predictor 230. Similarly, any desirable selecting structure may be used for the multiplexor 250.

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As can be readily seen, nothing in this citation teaches the highlighted portion of claim 12 above.

More particularly, the following assumption by the Office is not taught by the cited portions of Baweja:

“wherein as long as all the branch history information are not been used for the final result, then it’s smaller all of the branch history information stored within the storage means ...”

There is simply no such teaching by the cited portions of Baweja. The Office appears to be making “suggestions” that are simply unsupported by a rejection under 35 USC §102.

Accordingly, the Office fails to establish that claim 12 is anticipated.

Other independent claims include similar language as claim 12 and should be allowable for at least similar reasons. Accordingly, all pending independent claims are in condition for allowance.

Further, all pending dependent claims should be allowable for at least similar reasons as their respective independent claims, as well as additional or alternative elements that are recited therein but not shown in the cited prior art.

Claims 2, 11, and 14

Also, in rejecting the claims, the Office relies on elements 122 and 132 of Baweja. In particular, claims 2, 11, and 14, all indicate that a register is used to store the claimed portions of the branch history information. Baweja appears to use separate storage units (elements 122 and 132 for its different predictors).

Also, the claimed language highlighted above with reference to claim 12 (stating that each intermediate prediction unit uses a portion of the branch history information that is smaller than all of the branch history information stored within the storage unit) further distinguishes using separate storage units.

Accordingly, claims 2, 11, and 14 are allowable for at least this additional reason.

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Conclusion

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney (720-840-6740) to facilitate prosecution of this application.

Applicant hereby petitions, as well as includes the appropriate fee herewith, to obtain a 3-month extension of the period for responding to the Office action, thereby moving the deadline for response from March 18, 2007, to June 18, 2007.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 503133.

Respectfully submitted,

Customer Number: 50890

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Date June 18, 2007

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